

Lower Snake River Historic Hydrologic Conditions, Balanced With Current Basin Issues

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Abstract

Snake River Basin Hydrologic conditions experienced during the mid to late 1800's have been documented through various published items prepared during those times, including both Governmental reports and books prepared by noted authors.

This paper will present an overview of Snake River Basin hydrologic conditions experienced during this time period by the presentation of pictures, maps, and quotes obtained from reports prepared during those times. This will be done using current debates concerning the Lower Snake River Basin as a background focus.

Given the extensive efforts being expended at present to restore the environment to that which likely previously existed, to most efficiently achieve the proposed restorations it is important to both thoroughly understand the nature of the existing environments as well as the changes recently imposed on the environment, both through natural and man induced events.

Background

Environmental Restoration currently has much interest, both within the United States and worldwide, as evidenced by the volume of various ongoing environmental restoration studies, environmental restoration research work, and the implementation of new "environmentally friendly" design and construction methodologies. The theme of this Watershed System 2003 Conference, "H and H Support for Environmental Restoration," and the presentation of approximately 100 technical papers on this theme collectively further suggest the importance and relevance of this current topic.

Given the extensive efforts currently being accomplished to restore the environment to that state which likely previously existed, it is important to both thoroughly understand the nature of the previously existing environment as well as the changes recently imposed on the environment, both through natural and man induced events, in order to most efficiently and successfully achieve the proposed restorations. This

paper will present an overview of Snake River Basin hydrologic and ecologic conditions experienced during the latter half of the Nineteenth Century through the presentation of pictures, maps, and quotes obtained from reports prepared during those times, utilizing various published items prepared during those times, including both Governmental reports and books prepared by noted authors. Anadromous fish issues will be the primary environmental focus of this paper, given both the historical importance of and current interest in the various species of anadromous fish existing in the Pacific Northwest.

Figure 1 illustrates the changes over time of *Chinook Salmon* ***HARVEST*** as presented in a paper by D.W. Chapman, titled “Salmon and Steelhead Abundance in the Columbia River in the Nineteenth Century” (Reference #2). Chapman’s Figure 1, found on page 663 of his 1986 paper, was based on a Doctoral Thesis prepared by J. Van Hyning at Oregon State University, Corvallis, titled “Factors Affecting the Abundance of Fall Chinook Salmon in the Columbia River.” Figure 1 also includes indicators that show the completion dates of the first major Columbia River Project (Bonneville Dam) and the first Lower Snake River Project (Ice Harbor Dam).

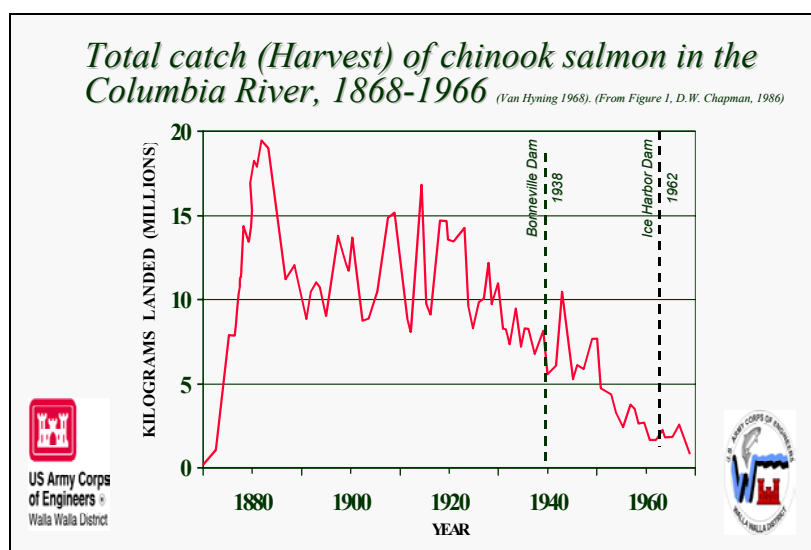


Figure 1. *Total Catch (Harvest)* of Chinook Salmon in the Columbia River, 1868-1966; Showing Also Columbia River’s Bonneville Dam and Snake River’s Ice Harbor Dam Completion Dates

As can be seen from Figure 1, the “maximum harvest” of Chinook Salmon on the Columbia River occurred in the early 1880’s; which was approximately 60 years prior to the completion of the first major “main stem Columbia River” project (Bonneville Dam) and approximately 80 years prior to the completion of the first “Lower Snake” project.

Marshall McDonald’s 1894 report, *The Salmon Fisheries of the Columbia River Basin*, (Reference #12) states that “the investigations made by Professor Evermann

and the parties under his direction establish conclusively the fact that there has been a very great reduction in the number of salmon frequenting the head waters of the Columbia River and its tributaries. This decrease is more notable in the main river.” It also states that “they were abundant in the Columbia River at Kettle Falls as late as 1878. Since then there has been a great decrease. They have been scarce since 1882. Since 1890 there have been scarcely any at Kettle Falls.” In addition, this report also states that “there is no reason to doubt- indeed the fact is beyond question- that the number of salmon now reaching the head waters of streams in the Columbia River Basin is insignificant in comparison with the number which some years ago annually visited and spawned in these waters. It is further apparent that this decrease is not to be attributed either to the contraction of the area accessible to them or to changed conditions in the waters which would deter the salmon from entering them.”

Current Lower Snake River Issues

Several “Internet Links” that are currently available provide interesting insights and viewpoints regarding present Lower Snake River issues; and are presented in this report for reference.

The following link is to the recently completed Corps of Engineers’ Walla Walla District’s “Lower Snake River Juvenile Salmon Migration Feasibility Study:”

<http://www.nww.usace.army.mil/lsr/>

Interest in the Lower Snake River Projects has extended across the continental United States, with the St Petersburg, Florida; newspaper, The St. Petersburg Times, recently (September 28, 2002) carrying an Editorial which starts out with the statement “Salmon on the Lower Snake River in Washington State are nearing extinction, and the only solution is to breach four hydroelectric dams.” The Northwestern Division Engineer, Brig. General Fastabend, promptly responded to this editorial (October 11, 2002), with both the original editorial and his response being found at this link:

<https://www.nwd.usace.army.mil/pa/issues/pdf/StPetersburg.pdf>

Recently (February 26, 2003), various conservationists and members of the sport and commercial fishing industries released their latest “Salmon Plan Report Card.” The report card may be found at the following web site, and concludes with the comment “that’s a dramatic failure, which must put the surest recovery option of removing the four Lower Snake River dams back on the table.”

<http://www.americanrivers.org/pressrelease/salmon022603.htm>

Also on February 26, 2003, the “Federal Caucus News” published a release titled “Federal Agencies give themselves a “B” in Fish Recovery Efforts,” which may be found at this web site:

https://www.nwd.usace.army.mil/pa/issues/pdf/PR_08_03.pdf

On April 10th, 2003, the Snake River was again listed on American River's list of the "Top Ten Endangered Rivers," as shown at this link:

<http://www.americanrivers.org/mostendangered/snake2003.htm>

Clearly the current interest in the Lower Snake River Basin is widespread and several divergent opinions are being expressed with respect to Corps Projects on the Lower Snake River.

Historic Basin Conditions

Given the intensity of the current debates regarding the Lower Snake River Basin, it is interesting to search back through historical records to gain an insight regarding historical basin conditions; with respect to such items as air quality and water quality. A wealth of historical information is contained both within Federal Government reports and other published documents, and several excerpts will be presented in order to present a general picture of both basin hydrologic conditions and an insight into the obvious problem of declining fisheries resources. Information regarding basin conditions such as water temperatures, air quality, and vegetation can be obtained from these reports.

Figure 2, from a report prepared during the 1890's (Reference #12), illustrates the conception of the "natural limits of distribution of salmon in the Columbia River Basin" at that time.

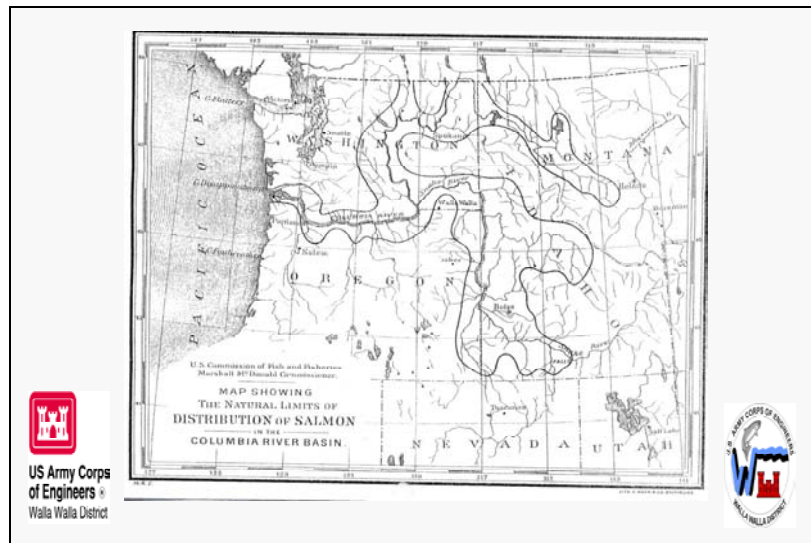


Figure 2. Map Showing the Natural Limits of Distribution of Salmon in the Columbia River Basin, from "A Report of the United States Commissioner of Fish and Fisheries on Investigations in the Columbia River Basin in Regard to the Salmon Fisheries," Government Printing Office, 1894.

The 1843 Fremont expedition report (Reference #7) contains regular observations of air temperatures and current predominant weather conditions, and notations of latitudes, longitudes, and barometric elevations. Vegetative conditions are also regularly described, as are accounts of associations with the Native Americans encountered. On October 22, 1843; while viewing the Walla Walla River from the Blue Mountains Fremont's account states that "the weather was smoky and unfavorable to far views with the glass." On October 25, 1843; his account describes the region near the confluence of the Walla Walla River and the Columbia River as "a plain of bare sands, from which the air was literally filled with clouds of dust and sand," due to the prevailing high winds. He also mentions that "we made our camp in a little grove of willows on the Walahwalah, which are the only trees to be seen in the neighborhood; but were obliged to send the animals back to the encampment we had left, as there was scarcely a blade of grass to be found."

Major Cross' Journal entry for September 11, 1849 (in Reference 18); describes the atmosphere near the Umatilla river as being "very smoky" and describes the terrain as "even more barren than that of the Snake River." The Umatilla River, near its confluence with the Columbia River, is described as being "narrow, and at this time the water lay in holes where we crossed it." The Journal also states "the whole country presented a scene of barrenness seldom met with, for not a tree was to be seen far or near."

Lt. Symons' report (Reference #22) describes the area near the confluence of the Columbia and Snake Rivers in 1881 as "a bleak, dreary waste, in which for many miles around sage-brush and sand predominate. Ainsworth is one of the most uncomfortable, abominable places in America to live in. You scan the horizon in vain for a tree or anything resembling one. The heat through the summer is excessive, and high winds prevail and blow the sands about and into everything. By the glare of the sun and the flying sands one's eyes are in a continual state of winking, blinking, and torment." He also mentions that "the railroad terminus across the river from Ainsworth was named, and for some time bore, the appropriate name of Hades, but some of the higher authorities condemned the name and substituted therefore South Ainsworth."

Mr. Smith visited Portland, Oregon; from June 16 through June 19, 1894; and described the Willamette River and Clackamas River at that time (Reference #19) as being "high and muddy." He had intended to also visit the Cascades and The Dalles but had to abandon this trip due to the high floods that had "entirely suspended railroad communication with the Upper Columbia and had rendered water transportation uncertain." It should be noted that the 1894 flood witnessed in part by Mr Smith remains the recorded "flood of record" on the Columbia River's gaging station at The Dalles (United States Geological Survey Station Number 14105700), with a discharge of 1,240,000 cubic feet per second being recorded on June 6, 1894, approximately 10 days prior to Mr Smith's visit.

A common question posed concerning the recent Lower Snake River Feasibility Study was “what did the Snake River Canyon used to look like?” Figure 3, taken from an early 1900’s Federal Report (Reference #10) might assist in answering that question.

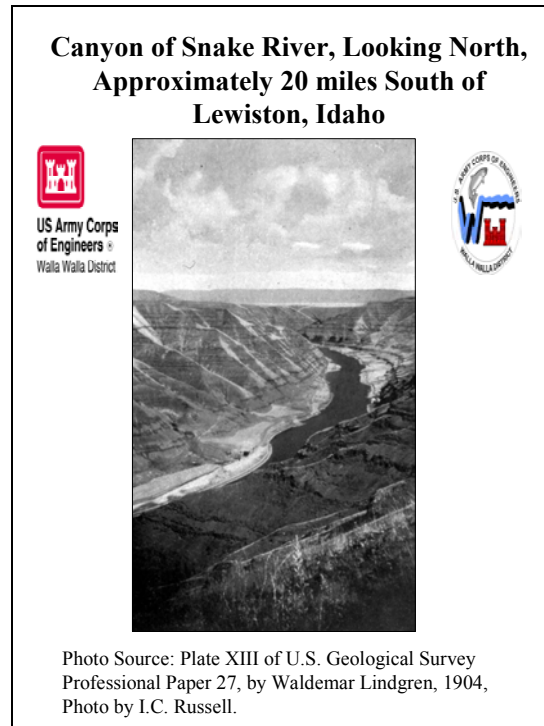


Figure 3. Snake River Canyon South of Lewiston, Idaho; Picture Taken in late 1800’s by I.C. Russell.

Several of the 1800’s era reports contain basic climactic information such as air and water temperature information. Fremont’s report (Reference #7) commonly reports air temperatures but does not present water temperatures, and this did not appear to be an item of interest. However, several of the reports regarding fisheries present water temperatures. Humphrey’s report on the Mississippi River (Reference #9) presents water temperatures for the Mississippi River at Carrollton, Louisiana; for the years 1851 through 1853, with water temperatures as high as 86 degrees Fahrenheit being noted.

The 1878 report (Reference #21) presents two (2) daily water temperatures for the Lower Columbia River at Clifton, Oregon; for the period from May 10, 1875; through August 14, 1875; with water temperatures exceeding 68 Degrees Fahrenheit (20 Degrees Celsius) being noted after July 17, 1875.

Gilbert’s and Evermann’s report (Reference #8) presents various “single valued temperatures” which were measured once at discrete points along various rivers. A brief summary of some of these locations and water temperatures is:

<u>Location</u>	<u>Date</u>	<u>Temperature (F)</u>
Yakima River at North Yakima	August 23, 1891	64
Toutle River near Castle Rock	August 27, 1891	59.5
Snake River near President Camp	August 14, 1891	62.5
Ross Fork of Snake River, near Pocatello	August 4, 1891	72.5
Portneuf River near Pocatello	August 2, 1891	76
Boise River near Caldwell	August 8, 1891	66
Payette River near Payette	August 9, 1891	63
Clearwater River near Lewiston	August 15, 1891 (10AM)	63.5
Clearwater River near Lewiston	August 15, 1891 (4PM)	83.5
Palouse River near Colfax	August 17, 1891	74
Pataha River near Starbuck	August 14, 1891	68
Upper Columbia River at Kettle Falls	August 16, 1891	62
Coeur d' Alene Lake near outlet	August 21, 1891	75
Walla Walla River near Wallula	August 23, 1891	70
Umatilla River near Pendleton	August 12, 1891	70
Yakima River near Prosser	August 24, 1891	70

Evermann's report about salmon investigations in the State of Idaho (Reference #6) presents water temperatures at several locations. Surface temperatures within Alturas Lake, also called Sawtooth Lake, were noted to range between 59 and 63 Degrees Fahrenheit between late July and late September 1895, and the lowest lake temperature noted was 54 degrees at a depth of 157 feet below the surface. Water temperatures were also measured in Pettit Lake, located approximately 6 miles north of Alturas Lake, and several values noted during July and August 1895 are presented in the report. The maximum difference between the surface temperature and that noted 165 feet below the surface was on July 29, when the surface temperature was noted to be 68 degrees F and the temperature at 165 feet below the surface was 58 degrees F. The report also presents water temperatures noted at Big Payette Lake during July through September 1895, as well as water temperatures of various streams in the vicinity of Big Payette Lake during that time.

Figure 4, which is based on temperature data contained within United States Geological Survey reports (Reference #11), illustrates the range of and variability of more recent Snake River water temperatures from 1952 through 1957, prior to the construction of both the Hells Canyon projects and the Lower Snake River projects.

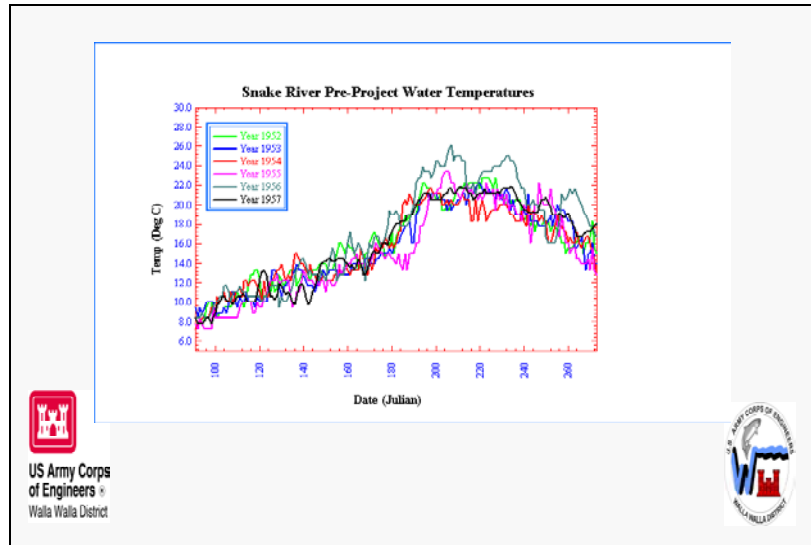


Figure 4. Lower Snake River Water Temperatures, Years 1952-1957; Prior to Construction of Four Lower Snake River Projects

Summary

Current interest regarding Environmental Restoration is keen and the arena offers much promise of future Hydrologic and Hydraulic work. To assist in directing current efforts towards those areas showing the best promise of successful restoration activities it can be helpful to review existing literature to realistically describe the “natural state” of areas of interest for Environmental Restoration. This paper has presented brief descriptions of both historical hydrologic conditions as documented within existing literature from the mid to late 1800’s as well as brief descriptions of current environmentally related debates regarding the Lower Snake River Basin. A list of References was also provided, which illustrates the scope of information available and which will easier enable those interested to further investigate the “historical hydrology” of the Snake River Basin.

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